

A TAXONOMIC REVIEW OF EUPTLEA

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With one text-figure

INTRODUCTION

IN STUDIES of the Trochodendraceae and Tetracentraceae, Nast and Bailey (1) and the writer (3) have briefly pointed out some of the fallacies of the commonly accepted inclusion of *Euptelea* in the Trochodendraceae. The purpose of the present paper is to summarize the data pertaining to the nomenclature and taxonomy of the Eupteleaceae. In agreement with van Tieghem and several other students, we have come to the conclusion that *Euptelea* is so isolated that it must logically be placed in a unigeneric family. The genus appears to us to consist of only two species, one Japanese and the other Chinese-Indian. Full citations to the pertinent literature will be found in the bibliography of my earlier paper (3), and the same herbarium abbreviations are here utilized. In the following paper in this Journal, Nast and Bailey (2) discuss the morphology of *Euptelea* and compare it with *Trochodendron*.

TAXONOMIC TREATMENT

- Eupteleaceae v. Tiegh. in Jour. de Bot. 14: 274 (Euptéléacées). 1900; Harms in E. & P. Nat. Pfl. Nachtr. 3: 111, as synonym. 1906; Hayata in Bot. Mag. Tokyo 39: (230) (Eupteleaceae). 1925; Makino & Nemoto, Nippon-Shokubutsu-Sôran (Fl. Jap.) ed. 2. 306. 1931; Wettst. Handb. Syst. Bot. ed. 4. 2: 686. 1935; Nemoto, Nippon-Shokubutsu-Sôran-Hoi (Fl. Jap. Suppl.) 207. 1936.
- Magnoliaceae IV. [sér.] Eupteleaceae Baill. Hist. Pl. 1: 191, p. p. (excl. *Trochodendron*). 1868-59.
- Euptéléées Parment. in Bull. Sci. Bot. Fr. & Belg. 27: 175, 318, p. p. (excl. *Trochodendron*). 1896.
- Trochodendraceae sensu Lee, For. Bot. China 449. 1935; Chen, Ill. Man. Chin. Trees & Shrubs 257. 1937; non Prantl.

In attempting to ascertain the proper authority for the family Eupteleaceae, one encounters the same problem as in the Tetracentraceae and various other families proposed by van Tieghem in the French spelling only. According to Art. 23 of the International Rules of Botanical Nomenclature (ed. 3. 1935), family names (with specified exceptions) must end in -aceae, and therefore van Tieghem's French names are not validly published. In the case of the Tetracentraceae (3), I proposed to accept van Tieghem's authorship, but perhaps I should be cited as the publishing author for that name. In the same way, the Eupteleaceae might best be referred to the authorship of "van Tieghem ex Hayata," since Hayata's brief note (in Japanese) in 1925 apparently first takes up the family name in the Latin form, citing van Tieghem's treatment of 1900.

Euptelea Sieb. & Zucc. Fl. Jap. 1: 133. 1841; Endl. Gen. Pl. Suppl. 2: 29. 1842; Meisn. Pl. Vasc. Gen. Pars Alt. 370. 1843; Lindl. Veg. Kingd. ed. 2. 580. 1847, ed. 3. 580. 1853; Seem. in Jour. Bot. 2: 237 (*Euptelia*). 1864; Eichl. in Flora 48: 13. 1865, in Jour. Bot. 3: 150 (*Euptelia*). 1865; Benth. & Hook. f. Gen. Pl. 1: 954. 1867; Baill. Hist. Pl. 1: 162, 191. 1868-69; Hook. f. Fl. Brit. Ind. 1: 39. 1872; Pfeiff. Nomencl. Bot. 1: 1305. 1874; Eichl. Blüthendiagr. 2: 150. 1878; Durand, Ind. Gen. Phan. 4. 1888; Prantl in E. & P. Nat. Pfl. 3(2): 23. 1888; King in Ann. Bot. Gard. Calcutta 3: 199. 1891; Harms in Ber. Deutsch. Bot. Ges. 15: 350. 1897, in E. & P. Nat. Pfl. Nachtr. 1: 159. 1897; v. Tiegh. in Jour. de Bot. 14: 270. 1900; Solereder in Ber. Deutsch. Bot. Ges. 17: 397. 1900; Rehder in Bailey, Cycl. Am. Hort. 2: 565. 1900; Hall. f. in Ber. Deutsch. Bot. Ges. 23: 89. 1905, in New Phyt. 4: 160. 1905; Finet & Gagnep. in Bull. Soc. Bot. Fr. 52: Mém. 4: 24. 1905 [repr. Contr. Fl. As. Or. 2: 24. 1907]; Harms in E. & P. Nat. Pfl. Nachtr. 3: 111. 1906; Lotsy, Vortr. Bot. Stammesg. 3: 457. 1911; Bean, Trees and Shrubs 1: 544. 1914; Rehder in Bailey, Stand. Cycl. Hort. 2: 1175. 1914; Chun, Chin. Econ. Trees 129. 1922; Rehder, Man. Cult. Trees & Shrubs 213. 1927, ed. 2. 244. 1940; Wettst. Handb. Syst. Bot. ed. 4. 2: 686. 1935; Lee, For. Bot. China 450. 1935; Chen, Ill. Man. Chin. Trees & Shrubs 257. 1937.

Trees or shrubs, the branchlets alternate, slender, with small scattered elliptic lenticles, marked at the base of each year's growth by the numerous concentric scars of bud-scales, the main branchlets often elongate and with numerous short lateral shoots; buds always axillary (terminal bud aborted, replaced by the distal axillary bud), subtended by a dilated and semi-sheathing petiole-base, ovoid or ellipsoid, in resting condition 5-10 mm. long and 3-6 mm. broad, acute at apex, both vegetative and floriferous buds composed of numerous papyraceous glossy entire castaneous or nigrescent often ciliate-margined scales; vegetative buds composed of 15-20 scales, the outermost broadly deltoid, 2-3 mm. long, 1.5-5 mm. broad, the inner one progressively larger, elliptic, up to about 10×7 mm., the young leaves strongly concave, the innermost ones conduplicate, the growing point terminal; floriferous buds composed of about 10-15 sterile scales, above which are about 6-12 floriferous bracts, these progressively more membranous, smaller, and narrower (elliptic to obovate to spatulate to linear), the innermost often about 3 mm. long, the flowers spiralled and greatly flattened in the bud, the floriferous bracts succeeded by one or two sterile bracts and several young leaves, the incipient branchlet terminated by the growing point; stipules none; leave alternate, 3-10 per season on the longer branchlets (or more on vigorous juvenile plants), often crowded and pseudowhorled on the short lateral branches and fewer (up to 7), the first-formed leaves (basal on the year's growth) often remaining small and undeveloped, sometimes subentire; petioles of mature and fully developed leaves slender, shallowly to deeply canaliculate above, often conspicuously dilated into a chartaceous sheathing bud-subtending base up to 6 mm. long and broad; blades of mature leaves smooth on both surfaces, acuminate at apex, serrate at margins, pinnate-nerved; inflorescence composed of about 6-12 flowers borne in the axils of bracts around the growing point and subsequently lateral by the vegetative development of the axis, the bracts (both sterile and floriferous) soon caducous, the flowers single, maturing before the development of leaves, often persistent in fruiting stage for more than a single season, hermaphrodite, proterandrous, anemophilous; pedicels subterete or slightly flattened, straight, slender, slightly swollen distally into a flattened torus

sometimes becoming minutely hirtellous at margin after anthesis, the flowers otherwise glabrous; perianth none; stamens borne in a single whorl on the torus near its margin, slender, the filaments filiform or slightly flattened, at length often twisted, slightly broadened distally, the anthers basifixed, linear-oblong, dehiscent by elongate lateral clefts and eventually twisting, the thecae 2, the connective produced apically into a flattened or subulate acute or subacute appendage; carpels free, borne in a single whorl just within the stamens but not definite in relation to these, conspicuously stalked, the stalks terete, gradually swollen distally, the ovary flattened, oblong or elliptic or dolabriform with the stigmatic margin ventral, or falcate with the stigmatic margin distal, obtuse at apex, the dorsal edge nearly straight or convex, the ventral edge concave and stigmatic for its entire length or merely distally, the stigmatic area covered with minute tangled sticky processes, the locule single, essentially circumalate, the ovules 1-3 (possibly very rarely 4), suborbicular, flattened, anatropous, attached to the ventral edge of the locule, horizontal or slightly pendulous, the micropyle superior; fruit a cluster of small samaras, each conspicuously stipitate, the stipes filiform at base, gradually swollen and flattened distally and expanded into the wing of the carpel; mature carpels (samaras) strongly flattened, essentially circumalate with papyraceous wings, obovate to oblong, tapering into the stipe at base, rounded at apex, the dorsal edge nearly straight or convex, the ventral edge more or less deeply indented (occasionally nearly straight) and stigmatic near the middle, the apical and basal portions of the wing conspicuous, the dorsal and apical margins thickened and vascularized, the locule usually situated slightly below the middle; seeds 1-3 (possibly very rarely 4), ellipsoid or obovoid, slightly flattened, rounded or subacute at base to an apiculate attachment, rounded at apex, the upper margin (distal in fruit) rounded, the lower margin subacute or keeled, the testa black or castaneous, papery, shining, the pericarp brittle, the endosperm oily, granular, copious, the embryo small, near basal end of seed.

KEY TO THE SPECIES

- Blades of mature and fully developed leaves broadly cuneate or rounded or truncate at base, terminating in a conspicuous acumen 1-4 cm. long, conspicuously and irregularly serrate, the largest lateral teeth up to 15 mm. long, greatly exceeding the inconspicuous smaller teeth; seeds usually solitary, sometimes 2; Japan..... 1. *E. polyandra*.
- Blades of mature and fully developed leaves acute to broadly cuneate (very rarely subtruncate) at base, terminating in an acumen 0.8-2 (rarely to 3) cm. long, comparatively regularly serrate, the largest lateral teeth not exceeding 4 mm. in length, not greatly exceeding the inconspicuous smaller teeth; seeds often 2, frequently 1, occasionally 3 (possibly very rarely 4); China and northeastern India..... 2. *E. pleiosperma*.
1. *Euptelea polyandra* Sieb. & Zucc. Fl. Jap. 1: 134. pl. 72. 1841; Hoffm. & Schultes in Jour. Asiat. 20: 293. 1852 [repr. Noms Indig. Pl. Jap. Chin. 37. 1853, ed. 2. 22. 1864]; Miq. in Ann. Mus. Bot. Lugd.-Bat. 3: 66 [Prol. Fl. Jap. 254]. 1867; Baill. Hist. Pl. 1: 162. 1868-69; Franch. & Sav. Enum. Pl. Jap. 1: 18. 1873; Pfeiff. Nomencl. Bot. 1: 1305. 1874; Kine in Ann. Bot. Gard. Calcutta 3: 199. 1891; Sargent in Garden and Forest 6: 52. 1893, For. Fl. Jap. 15. 1894; Parment. in Bull. Sci. Fr. & Belg. 27: 320. pl. 11, f. 49. 1896; Harms in Ber. Deutsch. Bot. Ges. 15: 350. 1897; Shirasawa, Ic. Ess. For. Jap. 1: 74. 1899, pl. 41, f. 17-30. 1900; v. Tiegh. in Jour. de Bot. 14: 271. 1900; Solereder in Ber. Deutsch. Bot. Ges.

17: 399. 1900; Schneider, Ill. Handb. Laubholz. 1: 270. f. 179. 1904; Vilmorin & Bois, Frut. Vilmorin. 8. 1904; Finet & Gagnep. in Bull. Soc. Bot. Fr. 52: Mém. 4: 24. 1905 [repr. Contr. Fl. As. Or. 2: 24. 1907]; Harms in E. & P. Nat. Pfl. Nachtr. 3: 111. 1906; H. Mayr, Fremdl. Wald- und Parkbäume 467. f. 188. 1906; Purpus in Mitteil. Deutsch. Dendr. Ges. 1906: 35. fig. 1906; Boodle & Fritsch, Solereder's Syst. Anat. Dicot. 809. 1908; Lotsy, Vortr. Bot. Stammesg. f. 278, 279 (as *Euptelea*). 1911; Matsum. Ind. Pl. Jap. 2(2): 97. 1912; Rehder & Wilson in Sargent, Pl. Wils. 1: 315. 1913; Silva Tarouca, Unsere Freil.-Laubgehölze 217. f. 250. 1913; Bean, Trees and Shrubs 1: 544. 1914; Rehder in Bailey, Stand. Cycl. Hort. 2: 1175. f. 1450, 1451. 1914; Hayata in Bot. Mag. Tokyo 39: (230). 1925; Mottet, Arbres et arbustes d'ornement 43. 1925; Rehder, Man. Cult. Trees & Shrubs 213. 1927, ed. 2. 244. 1940; Makino & Nemoto, Nippon-Shokubutsu-Sōran (Fl. Jap.) ed. 2. 306. 1931; Terasaki, Nippon Shokubutsu Zuhō (Ic. Fl. Jap.) pl. 39. 1933; Nemoto, Nippon-Shokubutsu-Sōran-Hōi (Fl. Jap. Suppl.) 207. 1936. *Euptelea polygama* Sieb. & Zucc. ex Rehder in Bailey, Cycl. Am. Hort. 2: 565, sphalm. 1900.

Slender tree or shrub, often freely branching and spreading, usually 5-15 m. high, the bark grayish and often rough; branchlets subterete, (1-) 1.5-3 mm. in diameter distally, purpurascens or brownish distally, grayish below, sometimes evanescently pale-strigose toward base of the yearly growth, the internodes on main branchlets 1.5-6 cm. long and on lateral shoots insignificant or occasionally up to 3 cm. long; petioles 0.6-1.2 mm. in diameter, 3-7 cm. long, sometimes sparsely strigose when young, soon glabrescent; leaf-blades papyraceous, when dried brown above and paler or greenish beneath, ovate or deltoid-ovate, 6-15 cm. long, 5-16 cm. broad, broadly cuneate or rounded or truncate at base and decurrent on the petiole, conspicuously acuminate at apex, terminating in a deltoid-lanceolate tooth 1-4 cm. long, conspicuously and irregularly serrate (teeth 2-5 per centimeter, obtusely callose, the largest ones deltoid-lanceolate, up to 15 mm. long, the smallest ones often only 0.5 mm. long), stramineous-strigose on principal nerves on both surfaces when young, at length essentially glabrescent or barbellate in nerve-axils beneath, the costa impressed or nearly plane above, prominent beneath, terminating in the apical acumen, the secondary nerves 5-10 per side, erecto-patent, straight or slightly curved, often branching distally, nearly plane or slightly impressed above, strongly raised beneath, terminating in the larger marginal teeth, the veinlets forming a copious reticulum, faintly impressed or nearly plane above, prominulous or plane beneath, the larger ones toward margin terminating in the smaller teeth; pedicels at full anthesis and in fruit 5-11 mm. long, the torus about 1-1.5 mm. in diameter; stamens 8-18, usually 10-15 mm. long at full anthesis, the filaments 4-7 mm. long at anthesis, the anthers with thecae 3-7 mm. long and an apical appendage 0.7-2 mm. long; carpels 8-18, the stalks usually 1-1.5 mm. long at maturity of stamens, the ovary at this stage 0.8-1.3 mm. long and 0.4-0.7 mm. broad, the stigmatic area 0.6-0.8 mm. long, the ovules 1 or 2; stipes of mature samaras 3-7 mm. long, the mature carpels (samaras) 6-8 mm. long and 3-4 mm. broad, the stigmatic portion 1.5-4 mm. long; seeds usually solitary, sometimes two, 2-2.5 mm. long, 0.9-1 mm. broad.

DISTRIBUTION: Japan, in central Honshu and on Shikoku and Kyushu, at elevations between about 400 and 1500 m. The type was collected by Siebold on Mt. Hakone (in the present Kanagawa Pref., Honshu). The plant is said to occur in mountain woods, usually in wet valleys or near streams, and it is apparently fairly common in

some localities. Although not of great ornamental value, the species is quite widely cultivated, apparently as a curiosity.

In the following citations, the localities are arranged in general from northeast to southwest, and the spelling used in S. Gerr's A Gazetteer of Japanese Place Names (Cambridge, Mass., 1942) is followed when possible.

JAPAN: (Without other locality): *Ex Herb. Lugd.-Bat.* (GH), *M. Kuenburg 1699a* (NY), *T. Hogg* (NY), *Collector?* (NY). HONSHU: Fukushima Pref.: Hills above Fukushima, *C. S. Sargent*, Oct. 26, 1892 (A); Kami-ogawa, near Taira, *R. K. Beattie & Y. Kurihara 10033* (US); Tochigi Pref.: Shiobara Mt., *U. Faurie 4184* (NY); Nikko, *E. H. Wilson 6704* (A), *O. Warburg 1302* (A), *K. Sakurai*, July 25, 1905, and Apr. 12, 1911 (A); Nikko to Lake Chuzenji, *C. S. Sargent*, Sept. 8, 1892 (A), *J. G. Jack*, Aug. 10, 1905 (A, GH); Gumma or Saitama Pref. [Prov. Musashi]: *G. Masamune*, June 20, 1926 (NY); Titibu, *Collector?* 20 (US); Mt. Burozan, *Collector?*, May 10, 1911 (US); Yamanashi Pref.: Between Sho'jiko and Kofu, *P. H. Dorsett & W. J. Morse 543* (US); Kanagawa Pref.: Mt. Hakone, *Maximowicz*, in 1862 (GH, US); Odawara, in Jugo Hakone, *Maximowicz*, in 1862 (GH); Miyanosito, Hakone Mts., *C. S. Sargent*, Aug. 25, 1892 (A); Hakone, Ninotaira, *T. Sawada*, Apr. 9, 1927 (UC); Nagano Pref. [Prov. Shinano]: *Maximowicz*, in 1862 (GH), *Tschonoski*, in 1864 (M, NY); Tsubakura-dake, *E. H. Wilson 7478* (A); Utake-gawa, *E. H. Wilson 7762* (A); Nojiri, *J. G. Jack*, Sept. 6, 1905 (A, GH); Gifu Pref. [Prov. Mino]: *K. Shiota 1950* (A), 5100 (A), 6567 (A); Pref. ? : "Jizogatake," *U. Faurie 5388* (UC), 5389 (A). SHIKOKU: Kochi Pref.: Shimokiragawa, *S. Watanabe*, May 23, 1886 (UC); Nanokawa, *K. Watanabe*, Mar. 26, 1886 (GH), May, 1888 (GH), *Collector?*, Mar. 26, 1891 (A), July 1, 1892 (US); Shimonanokawa, *S. Watanabe*, Mar. 22, 1887 (UC); Ehime Pref. [Prov. Iyo]: *Herb. K. Shiota 9458* (A). KYUSHU: No specimens seen, but cited from this island by Finet & Gagnepain (1905) and Matsumura (1912). CULTIVATED: *G. Nicholson 2315* (A) (Royal Gardens, Kew); *J. A. Purpus*, May 8, 1924 (A) and Sept., 1927 (A) (Darmstadt); *C. Schneider*, from seed coll. *C. S. Sargent* in 1892); *Collector?*, Sept. 26, 1916 (A) (Arnold Arb.). *C. E. Faxon*, May 11, 1911, Apr. 13 and 23 and May 11, 1912 (all A) (Arnold Arb.); *E. J. Palmer*, Apr. 5 and 17, 1913 (A) and Apr. 11, 1936 (M) (Arnold Arb. no. 865, from seed coll. *C. S. Sargent* in 1892); *Collector?*, Sept. 26, 1916 (A) (Arnold Arb.).

NATIVE NAMES: The most widely applied name is *Fusa-zakura*, but the following are also recorded: *Koja mansak* (by Siebold & Zuccarini), *Tani kouwa* (by Hoffmann & Schultes), *Fani kufa* (by Miquel and Franchet & Savatier), and *Taniguwa* (by Matsumura).



FIG. 1. Distribution of *Euptelea polyandra* (solid squares) and *E. pleiosperma* (solid dots). Each record represents an approximate locality from which herbarium specimens are available or have been reliably cited. From many of these localities numerous collections are known. From Goode's series of base maps, no. 226.

Euptelea polyandra is a deciduous tree, being leafless during the winter months. In its native habitat, the buds open toward the end of March and about the first of April the flowers are fully developed, the anthers shedding their pollen at this time. The carpels, although very small, probably have receptive stigmatic surfaces soon after this time. By the middle of May the stamens have fallen, the carpels are rapidly developing, and the leaves begin to appear. By the end of May or the first part of June the leaves are fully developed and the fruits are maturing. Essentially mature fruits are found on specimens collected during July, August, and September, during which period the next year's buds rapidly enlarge. By the first of November all the leaves have fallen and the buds are fully formed, while some of the fruits still persist. In this winter condition the plant rests until the following spring, the fruits being sometimes persistent for the entire winter.

2. *Euptelea pleiosperma* Hook. f. & Thoms. in Jour. Linn. Soc. Bot. 7: 243. *pl.* 2. 1864; Hook. f. Fl. Brit. Ind. 1: 39. 1872; Maxim. in Acta Hort. Petrop. 11: 39. 1889; King in Ann. Bot. Gard. Calcutta 3: 199. *pl.* 38, A. 1891; v. Tiegh. in Jour. de Bot. 14: 271. 1900; Solereder in Ber. Deutsch. Bot. Ges. 17: 399. 1900; Diels in Bot. Jahrb. 29: 346. 1900; Vilmorin & Bois, Frut. Vilmorin. 8. 1904; Finet & Gagnep. in Bull. Soc. Bot. Fr. 52: Mém. 4: 25. 1905 [repr. Contr. Fl. As. Or. 2: 25. 1907]; Harms in E. & P. Nat. Pfl. Nachtr. 3: 111. 1906; Boodle & Fritsch, Solereder's Syst. Anat. Dicot. 809. 1908; Rehder & Wilson in Sargent, Pl. Wils 1: 313, 315. 1913; Wilson, Nat. in W. China 1: 126, 224, 2: 11. 1913; Bean, Trees and Shrubs 1: 544. 1914; Rehder in Bailey, Stand. Cycl. Hort. 2: 1175. 1914; H. Lévl. Cat. Pl. Yun-Nan 174. 1916; Chun, Chin. Econ. Trees 129. *pl.* 49. 1922; Rehder, Man. Cult. Trees & Shrubs 213. 1927, ed. 2. 245. 1940; Hu in Contr. Biol. Lab. Sci. Soc. China 5(5): 11. 1929; Lee, For. Bot. China 451. *pl.* 128. 1935; Chen, Ill. Man. Chin. Trees & Shrubs 258. 1937; Fang in Ic. Pl. Omeiens. 1(2): *pl.* 57. 1944.
- Euptelea Griffithii* Hook. f. & Thoms. ex Baill. Hist. Pl. 1: 162. 1868-69.
- Euptelea Davidiana* Baill. in Adansonia 11: 305. 1875; Franchet in Nouv. Arch. Mus. Paris II. 8: 193. 1886 [repr. Pl. David. 2: 11. 1888]; Harms in Ber. Deutsch. Bot. Ges. 15: 351. 1897; Bretsch. Hist. Eur. Bot. Disc. China 856. 1898; v. Tiegh. in Jour. de Bot. 14: 271. 1900; Solereder in Ber. Deutsch. Bot. Ges. 17: 398. 1900; Vilmorin & Bois, Frut. Vilmorin. 8. 1904; Hemsl. in Hook. Ic. Pl. 23: *pl.* 2787. 1905; Finet & Gagnep. in Bull. Soc. Bot. Fr. 52: Mém. 4: 25. 1905 [repr. Contr. Fl. As. Or. 2: 25. 1907]; Harms in E. & P. Nat. Pfl. Nachtr. 3: 111. 1906; H. Lévl. Fl. Kouy-Tchéou 268. 1915.
- Euptelea pleurosperma* Groppler in Bibl. Bot. 6[Heft 31]: 21. *pl.* 1 & 2, f. 8, *pl.* 3, f. 9, sphalm. 1894.
- Euptelea Francheti* v. Tiegh.¹ in Jour. de Bot. 14: 271, 273. 1900; Vilmorin & Bois, Frut. Vilmorin. 8, 9. *fig.* 1904; Finet & Gagnep. in Bull. Soc. Bot. Fr. 52: Mém. 4: 25. 1905 [repr. Contr. Fl. As. Or. 2: 25. 1907]; Harms in E. & P. Nat. Pfl. Nachtr. 3: 111. 1906; Vilmorin, Hort. Vilmorin. 2. 1906; Rehder & Wilson in Sargent, Pl. Wils. 1: 314, 315. 1913; Wilson, Nat. in W. China 1: 52. 1913; Bean, Trees and Shrubs 1: 544. 1914; Rehder in Bailey, Stand. Cycl. Hort. 2: 1175. 1914; H. Lévl. Fl. Kouy-Tchéou 268. 1915, Cat. Pl. Yun-Nan 174. 1916; Chun, Chin. Econ. Trees 129. *pl.* 48. 1922; Hers in Jour. N. China Branch Roy. Asiat. Soc. 53: 110 [repr. Liste Ess. Lign. Honan 12]. 1922; Rehder in Jour. Arnold Arb. 4: 181. 1923; Mottet, Arbres et arbustes d'ornement 42. f. 18. 1925; Rehder, Man. Cult. Trees & Shrubs 213. 1927, ed. 2. 245. 1940; Hu & Chun, Ic. Pl. Sin. 1: 22. *pl.* 22. 1927.

¹ Although this epithet was spelled *Francheti* by van Tieghem, many subsequent authors have changed it to *Franchetii*.

Hu in Contr. Biol. Lab. Sci. Soc. China 5(5): 10. 1929; Lee, For. Bot. China 450. pl. 127. 1935; Chen, Ill. Man. Chin. Trees & Shrubs 258. fig. 1937.

Euptelea Delavayi v. Tiegh. in Jour. de Bot. 14: 271, 273. 1900; Harms in E. & P. Nat. Pfl. Nachtr. 3: 111. 1906.

Euptelea polyandra sensu Diels in Bot. Jahrb. 29: 346. 1900, in op. cit. 36: Beibl. 82: 45. 1905; Pampanini in Nuov. Giorn. Bot. Ital. n. s. 17: 267. 1910, in op. cit. 18: 115. 1911; non Sieb. & Zucc.

Euptelea minor Ching in Sunyatsenia 6: 15. pl. 1. 1941.

Slender tree or shrub, 2–15 m. high, the trunk up to 30 cm. (or more?) in diameter, the bark tawny brown or grayish, lenticellate; branchlets terete, striate when dried, usually 1.5–2.5 mm. in diameter distally, purpurascens distally, grayish below, glabrous, the internodes on main branchlets 1.5–3 cm. long and on lateral shoots usually inconspicuous; juvenile leaves often somewhat larger than those of mature plants, the blades up to 19 × 15 cm., often truncate to deeply cordate at base (unlike mature leaves); petioles 0.4–1.3 mm. in diameter, 2.5–6 cm. long, glabrous; blades of mature and fully developed leaves chartaceous or papyraceous, when dried brown above and paler or glaucous beneath, ovate or elliptic, 7–16 cm. long, 4–12.5 cm. broad, acute to broadly cuneate (very rarely subtruncate) at base and shortly decurrent on the petiole, acuminate at apex, terminating in a lanceolate or narrowly deltoid obtusely callose tooth 8–20 (rarely to 30) mm. long, regularly or somewhat irregularly serrate (teeth 2–4 per centimeter, callose-tipped, the largest ones deltoid, 1–4 mm. long, the smallest ones often only 0.5 mm. long or merely apiculate), glabrous or evanescently scattered-strigose or puberulent in groove of costa above, glabrous or sparsely barbellate in nerve-axils or subsersistently strigose on principal nerves beneath, the secondary nerves 6–11 per side, the venation similar to that of *E. polyandra*; pedicels inconspicuous at anthesis, 4–19 mm. long in fruit, the torus 0.7–1.5 mm. in diameter; stamens 6–14 in number, 8–19.5 mm. long at anthesis, the filaments 2–8 mm. long at anthesis, the anthers with thecae 4–10 mm. long and an apical appendage 0.7–2 mm. long; carpels 6–17, the stalks 0.5–1.5 mm. long at maturity of stamens, the ovary at this stage 0.5–1.5 mm. long and 0.3–0.6 mm. broad, the ovules usually 2, often 1 or 3 (possibly very rarely 4); stipes of mature samaras 4–16 mm. long, the mature carpels (samaras) 5–11 mm. long and 3.5–6 mm. broad, the stigmatic portion 1–4 mm. long; seeds often 2, frequently 1, occasionally 3 (possibly very rarely 4), obliquely superposed if more than one, 1.7–2.5 mm. long, 0.8–1.5 mm. broad, 0.7–1 mm. thick.

DISTRIBUTION: South-central China, in the Provinces of Honan, Shensi, Kansu, Hupeh, Szechuan, Kweichow, Sikang, southeastern Tibet, and Yunnan, and in north-eastern India (Assam), at altitudes between approximately 900 and 3600 m., doubtless to be expected in northern Burma and possibly in northern Indo-China. The species is apparently fairly common in parts of its range, occurring in woodlands and forests of hills and mountains, often in dense shade, sometimes in gulches on open slopes.

Localities cited below are arranged in general from northeast to southwest. Dr. J. F. Rock has kindly suggested the correct English spelling here used.

CHINA: HONAN: Tsi-yüan Hsien, Tien-tan Shan, *J. Hers* 11798 (A); Yung-ning, Tsi-li-p'ing, *J. Hers* 1340 (A); Sung Hsien, San-kuan Miao, *J. Hers* 549 (A); Sung Hsien, Shih-tzu Miao, *J. Hers* 1244 (A); Lu-shih, Kiaoho (Ch'iao-ho), *J. Hers* 972 (A); Lu-shih, Lao-chün Shan, *J. Hers* 1148 (A), 1177 (A); Lu-shih, Hiung-erh Shan, *J. Hers* 925 (A), 930 (A). SHENSI: Tsing-ling, 60 km. s. w. of Sian-fu, *J. Hers* 2097 (A); Tai-pai Shan, *W. Purdom* 1036 (A, US); Lung-tung-wan, in Tai-pai Shan,

G. Fenzl 908 (A); "Mt. Kin-tou-san" (Chin-t'ou Shan), *J. Giraldi*, July 14, 1897 (A, UC); "Thui-kio-tsuén, Miao-wang-san, Houan-tou-san, Kan-y-san, Ngo-san, Lao-y-san, and Lean-san," *Fr. Hugh (Scallan)*, 1899 (A, 11 sheets). KANSU: "Ad fl. Deschombunon, 10 Jüli, '85" [not seen, but this collection, by G. N. Potanin, was cited by Maximowicz in 1889; according to Bretschneider, *Hist. Eur. Bot. Disc. China* 1013, 1898, Potanin's party was in extreme southern Kansu, south of Siku, on July 10, 1885]. HUPEH: "Monte Si-ho, Ou-tan-scian," *C. Silvestri* 2960 (A); Hsing-shan Hs'ien, *E. H. Wilson* 139 (A, GH), 588 (A, GH, US); Chang-yang Hsien, *E. H. Wilson* 139a (A, GH, US); Pa-tung Hsien, *E. H. Wilson* 219 (A, US); Liang-sung-kou, *W. Y. Chun* 3768 (A), 4114 (US); Wan-tsoo Shan, *W. Y. Chun* 3939 (A); near Lung-men-ho, *W. Y. Chun* 4924 (A); western Hupeh (no other data), *A. Henry* 6455 (A, GH, US), 6918 (GH, US), *E. H. Wilson* 1048 (A, NY, US), 3133 (A). SZECHUAN: South Wu-shan, *A. Henry* 7337 (A, GH); Kai Hsien, *W. P. Fang* 10157 (A); Nan-chuan Hs'ien, *C. Y. Hwang* 161 (A); Chin-ting Shan, e. of Mou-chou, *E. H. Wilson* 3746 (A, GH, US); Kuan Hsien, *W. P. Fang* 2110 (A, NY), 2214 (A, NY), 2351 (A, NY), 2379 (A, NY); w. and s. w. of Kuan Hsien, *F. T. Wang* 2995 (A), 20666 (A); N'u-t'ou Shan, w. of Kuan Hsien, *E. H. Wilson* 3545a (A); Wei-kuan, *C. Bock & A. v. Rosthorn* 2517 (A); O-mei Hsien, *W. P. Fang* 2387 (A, NY), *S. S. Chien* 6142 (A); O-mei Shan, *T. T. Yü* 440 (A), *F. T. Wang* 23150 (A), *Y. S. Liu* 1177 (A), *C. Y. Chiao & C. S. Fan* 426 (A); *W. P. Fang* 6109 (A), 7555 (A, US), 7794 (NY), 7884 (A, NY), 12650 (A, US), 12829 (US); Ping-shan Hsien, *F. T. Wang* 22801 (A). KWEICHOW: Tu-yün, *Y. Tsiang* 5672 (A, NY, US); Kuei-yang, *Y. Tsiang* 8449 (A). SIKANG: Vicinity of K'ang-ting (Tachienlu), *A. E. Pratt* 77 (GH), *W. C. Cheng* 1650 (A, NY, US). Southeastern TIBET: Tshawarung Border, western range of Mekong on Khawakarpö, Dekar La, and Tshawarung, *J. F. Rock* 23064 (A, NY, UC); Tshawarung Border, Yung-chi Mt., *J. F. Rock* 23474 (A, UC). YÜNNAN: Mt. Kenichunpo and region of Ch'ang-p'u-t'ung, Salwin-Irrawady watershed, *J. F. Rock* 11224 (A, US); Mt. Kenichunpo, eastern and western slopes, *J. F. Rock* 22380 (A, NY, UC); mountains of Lendre, Mekong-Salwin watershed, *J. F. Rock* 8892 (A, NY, UC, US); mountains above Tzu-ku and Tz'u-chung, Mekong-Salwin watershed, *J. F. Rock* 9350 (A, NY, UC, US); Salwin River near Ch'ang-p'u-t'ung, *P. Genestier* 9948 (A); Der-la, Ch'ang-p'u-t'ung, *C. W. Wang* 65803 (A); "Dzung-quei," Ch'ang-p'u-t'ung, *C. W. Wang* 66929 (A); between Chung-tien and Chi-tsung, *H. F. v. Handel-Mazzetti* 7786 (A); S. Chung-tien, Ch'iao-t'ou on Yangtze bank, *K. M. Feng* 3994 (A); mountains of Lü-dü (Lu-tien), n. w. of Li-chiang, w. of Yangtze, *J. F. Rock* 18509 (A, NY, US); Ta-hou Shan, near Ta-ku, n. e. Li-ch'ang Snow Range, *K. M. Feng* 621 (A); Mekong-Yangtze divide, *G. Forrest* 19539 (A); Yangtze-Mekong divide, near Da-mu-chong (Ta-mu-chung), *G. Forrest* 21604 (A, UC, US); Mekong-Yangtze divide, n. of Pien-tien, *G. Forrest* 25460 (US); Mekong Valley, mountains of K'ang-p'u, Yeh-chih, and An-wa, *J. F. Rock* 8934 (A, NY, UC, US), 9069 (A, UC, US); Wei-hsi Hsien, Yeh-chih, *C. W. Wang* 68216 (A), 68240 (A), 68664 (A), 71735 (A); Wei-hsi Hs'ien, *C. W. Wang* 63606 (A), 63894 (A), 64750 (A), 67841 (A), 67847 (A), *H. T. Tsai* 57931 (A), 59596 (A), 63095 (A); Chung-tien Hsien, north flank of Ha-ha (Ha-pa) Snow Range, *K. M. Feng* 1198 (A); Mekong-Salwin divide, "Alulaka," *T. T. Yü* 19104 (A); Salwin Valley, Peng-ta, *T. T. Yü* 23102 (A); n. w. Li-chiang, Ta-mu-chung, *R. C. Ching* 21474 (A); Ho-ch'ing, Hsiang-shu-ho by Ma-erh Shan near Sung-kuei, *K. M. Feng* 748 (A, type coll. of *F. minor*); Ch'ien-ch'uan Mekong divide, *G. Forrest* 22253 (A, UC, US); between Chien-ch'uan plain and the Mekong drainage basin to La-chih-ming, *J. F. Rock* 6813 (A, UC, US), 8623 (A, NY, UC, US); San tcheng kiou (San-chiang-k'ou), Ho-ch'ing, *J. M. Delavay* 3749 (NY, cotype coll. of *E. Delavayi*); "Ié-ma-tchouan," *E. E. Maire* 250 (A); "Pé-long-tsin," *E. E. Maire* 495 (A); "Liang-shan La'mi," *H. T. Tsai* 51245 (A); Meng-tzu, *A. Henry* 10746 (A, M, NY, US); Yünnan, without further data, *G. Forrest* 13914 (A), 16206 (A), *T. T. Yü* 11287 (A), *H. T. Tsai* 57191 (A), 57356 (A), 57590 (A), 57602A (A), 57697 (A), 63132 (A). INDIA: ASSAM: *W. Griffith* 5022 (GH, source of the name *E. Griffithii*; probably also a duplicate of the unnumbered Griffith collection from Mt. Thumathaya, Mishmi Hills, which is the type of *E. pleiosperma*). CULTIVATED: *A. Rehder*, June, 1901 (A) (Hort. Vilmorin); *Arnold*

Arb. (A, several collections made on grounds between 1912 and 1933, from plants originating from collections of Purdom, Hers, and Wilson).

NATIVE NAMES: *Shui-tao* and *Shui-tao-tzu* are apparently the only regularly used local names, being recorded by several collectors. Numerous local names from Honan and Shensi, recorded by Hers and possibly not reliable, are: *Cheng-sin*, *Chen-sin-mu*, *Ho-ma-tzu*, *Lin-chuen-mu*, *Mo-yeh*, *Ta-yeh-tuan*, and *Yeh-chen-tzu*. Diels records the use of the name *Shan ye kao* in Szechuan.

The annual cycle of *E. pleiosperma* is essentially similar to that of *E. polyandra* as described above. Spring development is very rapid, and by the end of April the leaves are often nearly mature. The carpels mature quickly during May, and by July the fruits appear fully developed. Some specimens collected in November have both fruits and leaves persisting, but as a rule both are lost at this time, although the pedicels often persist over the winter. According to collectors' color notes, the anthers of *E. pleiosperma* are crimson or brownish, while the young samaras are white to green, becoming reddish or purplish at maturity.

The first mention of the occurrence of *Euptelea* outside of Japan was made by Hooker and Thomson in 1864, in a paper discussing the relationships of the genus. Although their discussion shows definitely that Hooker and Thomson regarded *Euptelea* as a distinct genus worthy of family rank, they refrained from proposing a new family and placed the genus provisionally in Magnoliaceae Sect. Wintereae. *Euptelea pleiosperma* is based upon a plant collected by Griffith in the Mishmi Hills of Assam, apparently collected late in the year, as the fruit is fully mature, the buds are well-formed, and "the specimens have a very few old leaves only." The Griffith specimen cited above (no. 5022), which was distributed from Kew under the name *Euptelea Griffithii*, is in similar condition and is almost certainly a duplicate of the type. The epithet *Griffithii* was unfortunately recorded by Baillon and must therefore be cited in synonymy.

Euptelea Davidiana Baill., described in 1875, was based on a flowering specimen collected in western Szechuan by David; Baillon's only discussion of its position states: "Species, a congener. chinensi et indica valde diversa, . . ." Baillon made the usual error of taking the flowers to be imperfect ("Carpella in flore masculo sterilia. . ."). Oliver (in Hook. Ic. Pl. 24: pl. 2361. 1895) and Harms (in Ber. Deutsch. Bot. Ges. 15: 351. 1897, in E. & P. Nat. Pfl. Nachtr. 1: 159. 1897) suggested that *Euptelea Davidiana* might be conspecific with *Eucommia ulmoides* Oliv. (1890), but they refrained from making the implied combination. There is no reason for such an assumption, as both Solereder (in Ber. Deutsch. Bot. Ges. 17: 398. 1900) and van Tieghem (in Jour. de Bot. 14: 271. 1900) have pointed out. Solereder, discussing the species at some length, refers it to the synonymy of *E. pleiosperma*; van Tieghem retains it as distinct on the grounds that the two types—one in fruit and the other in flower—could not be properly compared. Most subsequent authors have reduced *E. Davidiana* to *E. pleiosperma* without question, and this is doubtless its correct position.

Van Tieghem (op. cit. 271–273) recognized five species in *Euptelea* — the already described *E. polyandra*, *E. pleiosperma*, and *E. Davidiana*, and two new ones, *E. Francheti* and *E. Delavayi*. *Euptelea Francheti* was based on two collections of Farges from eastern Szechuan (“près de Tchen-Kéou”); *E. Delavayi* is typified by three collections made in Yünnan by Delavay. The characters utilized by van Tieghem to distinguish his two novelties from *E. pleiosperma* are not very convincing, and indeed *E. Delavayi* has been consistently referred to synonymy. *Euptelea Francheti*, however, has been maintained by most students for the eastern portion of the Chinese population of the genus.

In attempting to maintain more than one species of *Euptelea* in China, writers since 1900 have resorted to various characters of presumed diagnostic value. Finet and Gagnepain (in Bull. Soc. Bot. Fr. 52: Mém. 4: 24–25. 1905) utilized the shape of the fruit and the apex of the leaf to distinguish *E. Francheti* and *E. pleiosperma*. Other students have sought differences in the length of filaments and anthers and the number of seeds. Rehder and Wilson (in Sargent, Pl. Wils. 1: 313–315. 1913), on the basis of considerably more material than was available to previous workers, concluded that “The appearance of the under surface of the leaves, however, affords a constant character by which the species, and especially the two Chinese species, may easily be recognized.” This difference is summarized as follows:

E. Francheti: Under surface of leaves green, non-papillose, the epidermis being perfectly smooth.

E. pleiosperma: Under surface of leaves glaucescent, papillose.

The abundant material cited above has been carefully examined under high magnification with this difference in mind. The lower leaf-surface of many specimens is indeed “papillose,” the papillae being minute protrusions of epidermal cells. Furthermore, many specimens have the leaves obviously glaucous beneath, while others have them greenish or pale brown when dried. It is possible that the papillose texture is, on the whole, more marked toward the west and that it often accompanies a certain characteristic paleness. On the other hand, both glaucous and papillose surfaces are frequently found among the eastern specimens. These characters, therefore, do not seem to be associated with geographical distribution (as supposed by Rehder and Wilson), and one may doubt that they have any important genetic basis.

The most recent binomial referred to *Euptelea*, *E. minor* Ching, is based upon *Feng 748* from Yünnan (isotype cited above). This specimen bears young developing carpels and half-developed leaves and is in all respects typical of *E. pleiosperma*.

The most exhaustive examination of the available specimens fails to disclose any constant characters by which the Chinese population of *Euptelea* can be divided into groups for nomenclatural purposes. In spite of a high degree of variation in number and dimensions of parts, the species is fundamentally very constant. In fact, examination of my

key to the species, above, indicates that the only usable differences between the Japanese and Chinese populations are themselves somewhat unsatisfactory. However, characters pertaining to the shape and dentation of the leaves, together with the predominance of 1-seeded samaras in Japan and 2-seeded samaras in China, make the recognition of two species in the genus desirable.

POSITION OF THE FAMILY

In the discussion by Nast and Bailey (2) which follows this paper, the numerous and striking differences in morphology between *Euptelea* on the one hand and *Trochodendron* and *Tetracentron* on the other are taken up. In view of the nature and number of these differences, it must be assumed that tradition alone has been responsible for the long-continued placing of *Euptelea* in the Trochodendraceae. Even the character most often cited as a reason to combine *Euptelea* and *Trochodendron* in the same family — the absence of a perianth — is seen to be unreliable, since the toral bracteoles of *Trochodendron* may possibly be interpreted as perianth-remnants. There appears to be no other existing genus with which *Euptelea* can be satisfactorily compared, and the family Eupteleaceae may be said to be without close allies. That it is a member of the Ranales, in the broad sense, appears to be reasonably certain, but it is anticipated that an eventual revision of the entire order will result in the proposal of a separate suborder to include only the family Eupteleaceae.

LITERATURE CITED

1. NAST, CHARLOTTE G., and I. W. BAILEY. Morphology and relationships of *Trochodendron* and *Tetracentron*, II. Inflorescence, flowers, and fruit. *Jour. Arnold Arb.* 26: 267-276. 1945.
2. ——— and ———. Morphology of *Euptelea* and comparison with *Trochodendron*. *Jour. Arnold Arb.* 27: 186-192. 1946.
3. SMITH, A. C. A taxonomic review of *Trochodendron* and *Tetracentron*. *Jour. Arnold Arb.* 26: 123-142. 1945.

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